THE CHEMIST

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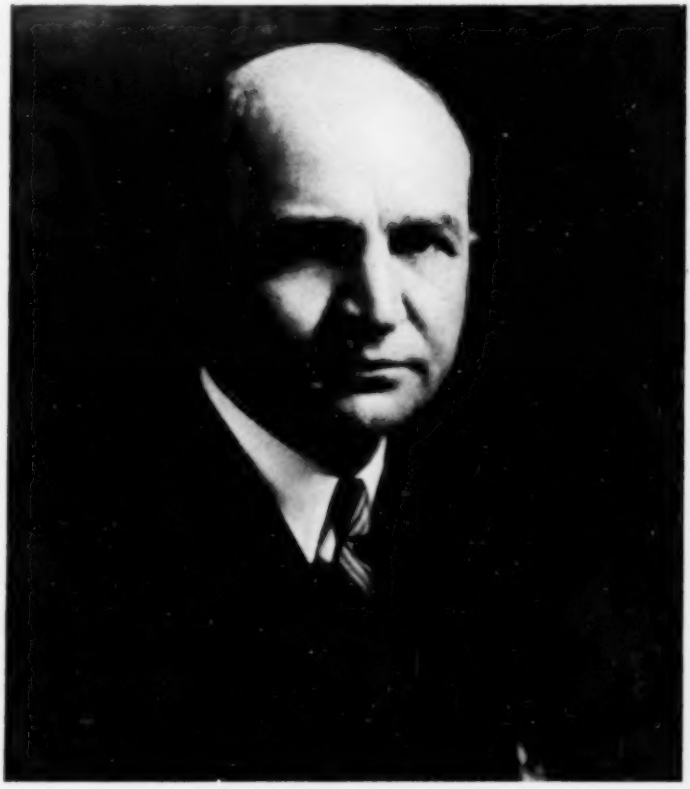
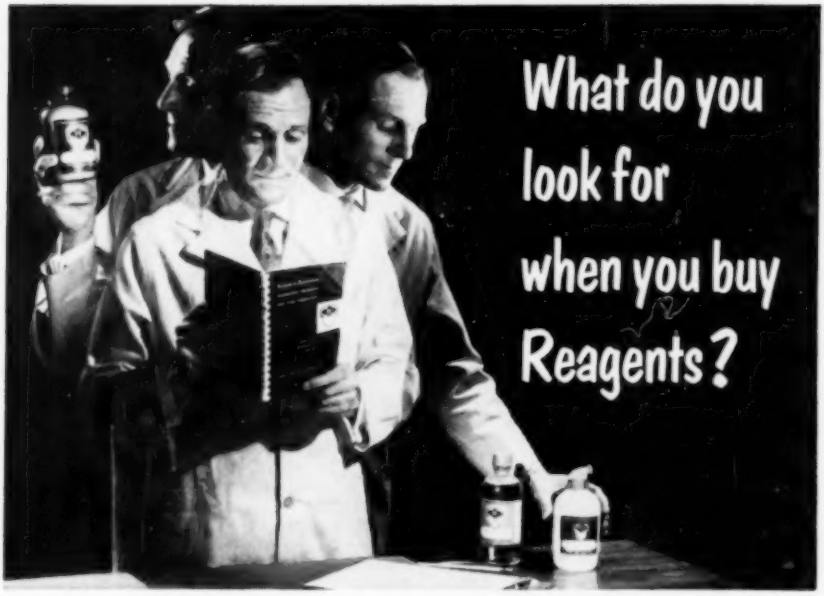


DR. MARTIN FISCHER, F.A.I.C.

Receives Ohio Award

(See Page 371)



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SCHEDULED FOR EARLY PUBLICATION

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Annual Reports
Communications

In This Issue

The Organization of a Research Laboratory,
Dr. Robert M. Burns **361**

Rewards and Responsibilities,
Dr. Gustavus J. Esselen, Hon. AIC **367**

Martin H. Fischer, Dr. James R. Withrow, Hon. AIC **371**

Dr. Fischer Receives Ohio Award **383**

Books on Chemistry—What the Educators Want,
A. H. Blatt, F.A.I.C. **385**

Conservation—Its Role in the Defense Program,
Blodgett Sage, F.A.I.C. **391**

Careers Ahead **397**

Opportunities **398**

Council **399**

AIC Activities **402**

For Your Library **405**

Condensates **408**

ANNUAL MEETING PAPERS

Continuing the series of excellent papers, presented at the 1952 AIC Annual Meeting, the following articles will appear in the September and later issues of THE CHEMIST:

Books on Chemistry—The Publishers' Viewpoint, by Fred P. Peters
The Technical Editor's Approach to an Expanding Literature, by D. O. Myatt
Employer-Employee Relations (Introduction to Session D), by Dr. George L. Royer, F.A.I.C.

The Orientation of Research Activities, by Raymond Stevens, F.A.I.C.
The Responsibility of Chemists in Patent Matters, by Dr Francis X. Murphy
Safety and Hygiene in the Plant, by Dr, L. T. Fairhall, F.A.I.C.
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The Organization of a Research Laboratory

Dr. Robert M. Burns

Chemical Coordinator and Director of Chemical and Metallurgical Research, Bell Telephone Laboratories, Murray Hill, N. J.

(Presented at the AIC Annual Meeting, May 8th, as part of Concurrent Session D, "Employer-Employee Relations.)

PAPERS and books have been written on the organization of a research laboratory[1] and there is little new that can be said. Periodic introspection, however, is doubtless justified in view of the tremendous expansion of research and its great importance to our internal economy and our national survival. The critical shortage of scientists and engineers emphasizes the importance of making certain that they are used most effectively and increased in supply.

The character of the organization of an industrial research laboratory will depend both upon the size of the company and the nature of its business. Investment in manpower and facilities for research must be undertaken on a reasonably long range basis without expectation of immediate profits. The degree of empiricism existing in an area of industry will suggest the proper distribution of effort between basic and applied research programs and this in turn will affect the composition of the research organization. Where the proportion of art is high and fundamental knowledge small, it is relatively easy for research men of average intelligence to make important contributions. On the other hand, in research-experienced industries where most of the easier things may have been discovered, further progress depends upon good basic research.

"Successful laboratory administration brings about free, democratic and cordial communication between top and bottom as well as across group lines beween people on the same level."

The organization of a research laboratory may be on a basis of special fields of knowledge, such as physics, physical chemistry, organic chemistry, etc.; it may be on a basis of functional assignment as, for example, product research, process development, materials or engineering design; or the laboratory may be organized on a project basis. Most industrial research laboratories are and

(1) See for example "The Organization of Industrial Scientific Research," C. E. K. Mees and J. A. Leermakers, McGraw-Hill Book Co., Second Ed. 1950; "The Theory and Practice of Industrial Research," D. B. Hertz, McGraw-Hill Book Co, New York, 1950.

probably should be mixtures of the three schemes, the relative proportions of each depending upon the needs of the company.

There can be little doubt that the basic research work of a laboratory is best arranged on a subject basis since it is concerned largely with the individual efforts of specialists bent upon the discovery of new knowledge and engaged in studies having no specific practical goal and no time schedule. The spectacular array of new products and new developments of the chemical industry which have meant so much to modern living are based upon a very few fundamental discoveries—so few perhaps as to be counted on the fingers of one hand. The continuing progress of this industry, comprising as it does nearly twenty per cent of all manufacturing industry, depends upon placing relatively greater emphasis on fundamental research. If, for example, the chemical industry were to devote but five per cent of its total effort to really basic research, revolutionary new developments would follow within a few years. The relatively small proportion of newly-trained scientists of high creative talent who appear each year should not be wasted on applied research and development assignments for which the greater number of practically-minded men are qualified and available. Some of these more gifted scientists will remain in the universities, but those who do venture into industrial laboratories will make significant scientific contributions, provided the atmosphere is made conducive to basic research. For example, they must be permitted and even encouraged to publish scientific work and be sent to scientific meetings.

In a functional type of organization, the manpower and facilities of the company are brought to bear on applied research programs. Specialized techniques are applied to the development of new products and processes in a manner somewhat resembling a manufacturing production line. It is an efficient and dependable method in which each step in the process is manned with the required talents; it is not applicable to the conduct of basic research.

The project operation of a laboratory concerned with appplied research consists in the combined effort of a group of appropriate specialists assigned to each problem or project and centrally directed by a project leader. It is a rapid method of attaining a definite goal but may be somewhat wasteful of manpower where the continuous full-time effort of all team members is not required. In some cases, it is feasible to utilize certain specialists simultaneously on two or more projects.

Large laboratories may conduct a good deal of their basic research on a cooperative plan in which specialists in many of the fields of physical science

collaborate in major long-range programs while at the same time pursuing fundamental investigations in their own fields of specialization.

The only purpose of the organization of the research staff into groups and sub-groups is to define responsibilities and relationships and to delegate authority in such a way as to assist the efforts of individuals and achieve effective group performance. Insofar as the organization chart assumes in the minds of laboratory personnel a military chain of command, a diagram of a caste system or implied social distinction, it will be devastating to morale. Successful laboratory administration brings about free, democratic and cordial communication between top and bottom as well across group lines between people on the same level. Nothing is more ridiculous or wasteful of effort than a policy and practise which requires a man to go up through several supervisory levels and back down in order to communicate with his opposite number in another group.

The effectiveness of a research laboratory will be determined largely by the position of its director in the company management. It is coming to be well recognized that the top research man, whatever his title, must report directly to the chief executive officer of the company and be his trusted advisor on the company's research program. No other individual has greater responsibility for the future position of the company. Yet in many concerns it is to be feared that the general sales manager has an undue influence on the research program and insists on speaking for the research department in contacts with other companies. Finally, the height of absurdity may be cited in the reported practise of one company of having its research director report to the general patent attorney who proposes the inventions that shall be made each month!

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The head of the research department has the dual function of administration and technical direction. He may, depending upon his inclinations, delegate much of the administrative load to a subordinate who may have some such title as laboratory manager, or administrative assistant. The department head must, however, have the overall responsibility for the business aspects of the research department's operations. As to technical direction of the department, it will be fortunate if he agrees with the philosophy of Dr. C. E. Kenneth Mees that "no good research director really di-

rects research; what he does is to protect his men from those who would direct them."

It has been pointed out that many of the well-known industrial research laboratories were built around the personalities of their research directors. In recent years, large laboratories have approached universities in the diversity of talent assembled and, building on the work of previous investigators, have tended to develop a sort of research of superpersonal group intelligence in the conduct of research. Consequently the research director now needs to be a scientific generalist[2] as distinguished from a specialist. That is, he needs to have an understanding of the broad field of science and a keen and sympathetic appreciation of the ideas of his specialists; he must have the ability to choose and promote those ideas that are sound. At the same time, he must be able to discourage the less promising or unsound suggestions without discouraging the author of these ideas.

The life and quality of any organization depend upon the continuing recruitment of able men. In a research laboratory, the selection of men having the proper qualifications is one of the major tasks of the research director. Only he, his group leaders and practising scientists and engineers can really appraise the potential qualities of candidates for the staff and their individual and combined judgments may be wrong. Often the candid opinion of a teacher or fellow graduate student as to a prospective employee's mental qualities and personal traits is most useful in determining his suitability for a given position in the staff.

Everyone is well aware of the scarcity of scientists and engineers. With some 3,300 industrial concerns undertaking research programs and vastly increased research efforts by government agencies in university, government and industrial laboratories, there are not enough trained men to go around. There appears to be no prospect of improvement in this situation for several years and then only if greater numbers of young people can be induced to prepare for scientific and engineering careers. Less than sixty per cent of the younger generation graduates from high school; only a third of these go to college and only two-thirds of those who enter college actually graduate[3]. Since about ten per cent of the six million high school students have an I.Q. of 120 or more and are thus equipped for college work, it seems likely that tens of thousands of individuals are lost to the engineering and scientific professions. It is important that these people be discovered and induced to

(2) H. Bode, F. Mosteller, J. Tukey and C. Winsor, *Science 109*, 553 (1949).

(3) Applied Research in the United States. Eugene W. Scott, Editor, Publication 210, National Academy of Science—National Research Council, Washington, D. C., 1952.

consider training for engineering and scientific careers. This appears to be the only source from which to obtain a larger supply of these much needed individuals.

In conclusion then it is important that the organization of a research laboratory provide for a continuing program of long range basic research, small perhaps in comparison with the effort in applied research and development; that these basic studies be assigned to the most creative-minded and broadly trained scientists who can be found without robbing the universities of those gifted men of this category who possess also teaching talents and interests. Finally, it is suggested that industry recognize the necessity of contributing both thought and financial support to programs designed to increase the supply of chemists, chemical engineers and other kinds of professionally trained men required in the modern world.

Elections: By The Chemists' Club, New York, N.Y.; President, William F. George; resident vice-president, Ira Vandewater; non-resident vice-president, R. J. Quinn; suburban vice-president, F. W. Sullivan; treasurer, L. E. Erlandson; secretary, Lloyd Van Doren, F.A.I.C. Elected as trustees for three-year terms are Thomas B. Drew, S. H. Farkas, Foster D. Snell, F.A.I.C., and Lincoln T. Work, F.A.I.C.

Appointed: Dr. Herman A. Bruson, F.A.I.C., as manager of the Organic Research Department, Olin Industries, Inc., New Haven, Conn. He was formerly manager of the Polymer Laboratory of Industrial Rayon Corporation. He holds 250 U. S. Patents in the fields of plastics, coating materials, petroleum additives, synthetic detergents, and other materials. He received the B.Sc. degree from Massachusetts Institute of Technology in 1923, and the D.Sc. from Technische Hochschule, Zurich, Switzerland, in 1925.

Advanced: Dr. Robert P. Parker, F.A.I.C., to the position of director of chemical research of the American Cyanamid Company, Calco Chemical Division, Bound Brook, N. J., to succeed Dr. H. Z. Lecher, F.A.I.C., who retired April 1. Dr. Parker was appointed assistant to the director of research in 1946, and became assistant director of research of the Pharmaceutical Section in 1947. He received the Ph.D. degree from Yale in 1933 and, as a student trainee at Calco, joined the Research Department in 1934.

Appointed: By Carbide & Carbon Chemicals Company, Division of Union Carbide & Carbon Corp., J. W. Ross as Philadelphia District Manager of the company's sales offices at 12 South 12th St., Philadelphia, Pa.

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Rewards and Responsibilities

Dr. Gustavus J. Esselen, Hon. AIC

Vice President, U. S. Testing Company, Inc., Manager, Esselen Research Division, Boston 16, *Mass.*

(Talk given by the chairman of the AIC Committee on Honorary Membership at the Honor Recipients' Luncheon, May 8th.)

What honors are given by THE AMERICAN INSTITUTE OF CHEMISTS*? How are the recipients chosen? Who will receive Honorary AIC Memberships this year? Dr. Esselen's article answers these questions.*

RALPH Waldo Emerson had read philosophy, science, poetry, and histories, but none of them had said anything about an effective and harmonious way of pushing a female calf into a barn. His son, Edward, grasped an ear, the father pushed diligently from behind and together they tried to propel the animal. The heifer resisted with calm obstinacy. The pale face of the sage reddened and beads of perspiration gathered on his high forehead. And then an Irish servant girl came by. With an amused glance she thrust a finger into the animal's mouth, and the calf, seduced by this maternal imitation, at once followed her into the barn. Edward grinned, but Emerson was already absorbed in thought. After cleaning his hands of their hairy, bovine smell, he recorded this telling declaration in his journal: "I like people who can do things."

This luncheon is a reunion of men who have demonstrated their ability to do things in the profession of chemistry and whose work has been recognized by the award of the Gold Medal of the Institute, by the Honor Scroll of an AIC Chapter, or by Honorary Membership in the INSTITUTE.

Our fellow member who arranged the program thought it would add dignity to label my remarks, "Rewards and Responsibilities." This is a nice piece of alliteration and sounds very fine. But to me "rewards" is not the proper word. It sounds too much like finding a pocketbook and receiving a reward for returning the thousand dollars it contained. No chemist or chemical engineer ever started out on a line of research or development with the thought of some particular prize or reward in mind. His only thought was to accomplish what he had set out to do. "Something accomplished, something done," was the reward he had in

mind. Rather, it seems to me that it would be more appropriate to discuss "Recognitions and Responsibilities." It is only human nature to appreciate the recognition of one's peers, particularly when the recognition comes from a group made up of individuals who are thoroughly conversant with the activity concerned.

It must be admitted that special recognition works both ways; it reflects credit on the individual selected for the honor as well as on the organization which grants it. Then there is the element of surprise which gives added pleasure and satisfaction to the recipient. Most honor recipients are modest people and rarely expect or anticipate any reward for what they have done. It comes as a surprise and it is a human characteristic, which is with us from childhood, to be pleased with surprises.

THE AMERICAN INSTITUTE OF CHEMISTS, in setting up its Honor recognitions takes every precaution to make them true surprises both for the recipient and for the public. The deliberations of the selecting committee are kept entirely confidential and no public announcement is made until the man honored has been notified and accepted.

The highest honor is the Gold Medal of THE AMERICAN INSTITUTE OF CHEMISTS. It was established in 1925, and to my mind, its value is enhanced by the fact that it has not been granted every year. No award was made in 1928, 1935, or 1939. In all, including this year, twenty-four Gold Medals of THE AMERICAN INSTITUTE OF CHEMISTS have been granted, "For noteworthy and outstanding service to the science of chemistry or the profession of chemist in America."

Second only in distinction to the Gold Medal of the INSTITUTE is the award of Honorary Membership. This is provided by the constitution in the following words:

> "Honorary members shall be persons of unusual distinction in chemistry, by reason of professional accomplishment and service to the profession or the public, considered as meriting special recognition, who have been nominated by the Committee on Honorary Membership and elected by the Council."

The first honorary memberships were awarded in 1924. There were three in that year, awarded respectively to Charles E. Munroe, Ira Remsen, and Edgar Fahs Smith. In the twenty-eight years since then, there have been a total of forty-six honorary members of whom twenty-nine are still living.

Recent Committees on Honorary Membership seem to have gone on the principle that while there are many Fellows of the INSTITUTE worthy of Honorary Membership, nevertheless the value of such a distinction is inversely proportional to the frequency with which it is given. I think you will agree that this is a wise provision. It should be remembered also

that while the actual ceremony of award is usually arranged by the local Chapter where the recipient resides, the Award of Honorary Membership is actually granted by authority of and on behalf of the national organization. It is an award of THE AMERICAN INSTITUTE OF CHEMISTS and not limited to the local Chapter.

On the other hand, a number of Chapters which have wanted to recognize members of their own group have awarded Honor Scrolls. The Chicago Chapter instituted this practice as early as 1942. Honor Scrolls have been awarded since then by the New York Chapter, the Pennsylvania Chapter and the Ohio Chapter. The New Jersey Chapter and the Washington, D. C. Chapter are awarding Honor Scrolls for the first time this year.

While we in the profession of chemistry freely recognize the distinction of these several awards, it must be recognized that outside of our profession, the world at large is little cognizant of their significance. Their real value lies in the fact that they come from one's peers.

You remember the story of Gustavus III of Sweden. Once, when he was visiting Paris, a deputation of French scientists called on him. It congratulated him on the happy fortune that had given him so great a man as Scheele, the discoverer of magnesium, as his subject and fellow countryman. The king, who took

small interest in the progress of science, was somewhat ashamed that he should be so ignorant as never even to have heard of the renowned chemist. He dispatched a courier at once to Sweden with the laconic order: "Scheele is to be immediately raised to the dignity of a count." "His Majesty must be obeyed," said the Prime Minister, "but who in hell is Scheele?" A secretary was told to make inquiries. He came back with very full information. "Scheele is a good sort of fellow," said he, "a lieutenant in the artillery, a capital shot, and a first-rate hand at billiards." The next day the lieutenant became a count and the illustrious scientist was completely forgotten by King and Court.

No consideration of the awards of the INSTITUTE would be complete without mention of the medal awards to students. These are particularly valuable, coming as they do at the beginning of a man's career, because they cannot help serving as a booster of morale of a sort that all young

men appreciate. The Student Medals of THE AMERICAN INSTITUTE OF CHEMISTS are "given in recognition of leadership, excellence in scholarship, and character, for the purpose of stimulating interest in the science of chemistry and the profession of chemist." The awards are made by the Council of THE AMERICAN INSTITUTE OF CHEMISTS upon the recommendation of the respective chapters; and are given to a senior who is majoring in chemistry at an educational institution of recognized standing. The By-Laws provide that in making the selection of those to receive the medals, equal consideration is to be given to scholarship and to the personal qualities of integrity and leadership. In 1951, seven Chapters made a total of sixty-one student awards, twenty-two of which were granted by the Chicago Chapter to seniors in various parts of the Middle West.

New Honorary Members

I spoke of the value of the element of surprise in making awards. It adds pleasure for both donor and recipient. It is my pleasant privilege to announce the names of the three men to whom Honorary Membership in THE AMERICAN INSTITUTE OF CHEMISTS has just been awarded:

Sidney D. Kirkpatrick. Outstanding editor, who by taking strong stands where needed for the good of the profession, promoting the Chemical Engineering Achievement Award, taking active leadership in professional societies, and encouraging younger men by speaking and guiding junior groups and individuals, has contributed to the professions of chemistry and chemical engineering far beyond the normal call of duty.

R. Lindley Murray. Outstanding leader in research and development in the chemical industry, who has devoted his lifetime to skillful and sympathetic human relations with his professional associates, particularly in the line of training and guidance of younger men, who with him have made outstanding contributions to the chemical industry.

Glenn T. Seaborg. Outstanding nuclear chemist and Nobel Laureate, who not only through his own research, but through the teaching, inspiration and leadership of the research of others, contributed to the advancement of human knowledge, and by his personal and technical contributions has elevated the profession of chemist in the eyes of the world.

On behalf of THE AMERICAN INSTITUTE OF CHEMISTS, I wish all of these men many years of happiness and continued achievement in their chosen fields.

Retired: Dr. William L. Prager, F.A.I.C., professor of chemistry at City College, New York, N. Y. Dr. Prager has taught at City College since 1908. More than ten thousand students have attended his classes. He received the B.S. degree from City College, the M.S. from New York University, and the Ph.D. degree from Clark University.

Moved: Jefferson Chemical Company, Inc., to 260 Madison Avenue, New York 16, N.Y.

Martin H. Fischer

Dr. James R. Withrow, Hon. AIC

Consulting Chemical Enginer, 77 16th Avenue, Columbus 1, Ohio

(Presented on the occasion of the presentation of the Ohio Award to Dr. Fischer, April 25th, at Dayton, Ohio.)

WHEN this program was in preparation, there was to be an address by a distinguished colleague of Dr. Fischer discussing his scientific achievements, and I accepted the assignment of recollections of Dr. Fischer as a person—quite a different point of view.

I awake now, without warning, to the situation that the scientific achievements are not to be discussed by the colleague and the two points of view have been gelled into one: The achievements of Dr. Fischer. This is for me a tough though pleasant assignment. It has become a delicate jelly which I must carry, if possible, without too much omission of important ingredients, and with no spillage of the delicate concoction which has gelled in my lap, I hope without too much loss to my ever friendly neighbor.

So you see the concoction is wholly artificial (to consume half the time), and is not of my making. Its very nature makes it without life, so it might defy the art even of our distinguished guest. He must possesss his soul in patience while we satisfy the makers of programs in their need.

For my part I can make small claim to be among the wise, of the Indian (Sanskrit) legend-parable, who could put life into these bones, but I hope I can be counted with the "common man" who seems to have had a working knowledge of what was going on in the mind of scholars and where it was bound to lead them (and all of us), in a favorite story from the Panchatantra—our writing of which seems to be dated Ca. 1500 B.C. Indian peoples have had its advantage for a long time but seem to have acquired antidotes to its application.

Three wise men of a village had a friend named Bill, (or its equivalent). They liked Bill. He was patient (listened to their learning), but he had no learning — just common sense, no doubt shown by his listening to them.

The three wise men eventually decided to travel that they might indoctrinate the world and learn new things, if such there were for scholars like them. But what to do with Bill? He could do none of these things for the world, he was no scholar, he had only common sense. But they finally took Bill anyway.

In their travels they found in a forest a pile of white objects, at which they marvelled. But one of them

said, this is my field (and who should contradict). These are bones—the bones of a lion. I can put them together. Then another said, if that is so—this is my field. I can put muscle and skin on them. Whereupon the third scholar said, in that case this will then be my field, I can put the breath of life in him. But Bill said, Whoa! Wait till I climb this tree. In due time Bill arrived back at the village and told what happened. The narrator possessing only commonsense was the sole survivor.

Martin H. Fischer seems to have begun his earthly pilgrimage November 10, 1879. This youth in all but learning, is about a year younger than myself.

Martin Fischer and Wolfgang Ostwald

I suspect I met Martin Fischer through our mutual former acquaintance and friend, Wolfgang Ostwald, editor of *Zeitschrift fuer Kolloide Chemie*. Wolfgang was a life-long friend and admirer of Martin Fischer, but Fischer is a whole year younger and his memory may be more accurate. Wolfgang Ostwald—Martin Fischer, I cannot think of one without the other. Ostwald was out in his country place forty miles away when I was last in Leipsig—so we missed him. I owed him a paper for some years which he made me promise him when he saw some of our work in Columbus. The paper was written carefully and typed and suddenly deposited in a little drawer in my desk where it remained undisturbed for years. Why? The Kaiser had demanded possession of the armies of France to guarantee peace while he dealt with Russia for mobilizing against the Austria-Hungarian Monarchy in its attack on Serbia, allegedly over Ferdinand's assasination by a student some months before, but really a tariff on pigs— Complicated enough. But too much for even my stomach, well-trained in the best German tradition of the elder von Molke and Bismarck. The paper about to be mailed was caught in time to prevent becoming an apparent ally of Wilhelm and Franz-Josef. The paper was never published, and it is as good today as then—but Wolfgang is no more.

Wolfgang Ostwald and Some American Limitations

When Wolfgang lived among us in Columbus briefly, he told me of an experience in Dayton which astonished him. He was invited to be the guest speaker at the National Cash Register noon gathering of employees. Many distinguished men were caught on the fly passing through, addressed these workers' assemblies. Wolfgang Ostwald was such a one. He told me that the officer of the company, sales manager or otherwise, who introduced him in the great assembly hall, still performing that civic service, I understand, said:

"Ladies and gentlemen, we have

as our speaker today the world renowned chemist and scientist, Dr. Wolfgang Ostwald of Leipsic, Ohio." Wolfgang did not laugh as he told this. It was as though the Kingdom of Saxony had been affronted. It was like the affront to the British Empire when the Kansas school girl told my friend Corder, the great English Quaker, when he asked her if she knew where Great Britain was, and she said: "Oh yes—two small islands in the Atlantic that speak our language!" Corder told me that three times in one crossing. So it was subcutaneous.

So Wolfgang said plaintively—there is no Leipzig in Ohio! But there is, I had to say, just one hundred miles due north of Dayton in Putman County and a little south of Napoleon—population 1,400. I do not know if this was solace or not.

The Early Section of Martin Fischer's Achievements

Though Wolfgang is dead he yet speaketh, and even now comes to our aid in honoring Martin Fischer, though the facts are Martin Fischer is indeed honoring us and honoring THE AMERICAN INSTITUTE OF CHEMISTS as well as its Ohio Chapter. We thank you, Martin Fischer.

Martin Fischer Has Received No Mean Appreciation

Among the many honors he has received are the Hatfield Prize, the Cartwright Prize, the A.M.A. Gold Medal for Research, many diplomas,

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a Silver Medal, the International Prize of Kolloid Gesellschaft. He is a Fellow of many societies. His work has been translated into German, Russian, and Japanese. He has himself translated many works beginning with Coben's Physical Chemistry and Ostwald's Colloid books.

If you desire to read a great classic in our science of Chemistry and see Martin Fischer as a whole, as you cannot see him in a single series of his articles, and see also the estimate of a great editor, read Wolfgang Ostwald's "Martin H. Fischer upon His 60th Birthday, November 10, 1939." *Kolloid Zeitschrift* 89, 1, (1939) or its translation, *Journal of Medicine*, 20, 436, Cincinnati, Ohio, December 1939.

A few transcripts from this will show clearly where honor indeed is due as no one could show it but the great German editor and friend of Martin Fischer.

Martin Fischer a Master of Colloids

"Martin Fischer already belongs with the masters of colloid chemistry. His life's work for science began in

1899 when as a twenty-year old student in medicine, he first stepped into public notice with some histological observations.

Martin Fischer—"Klassiker"

"If in the consciousness of the responsibility involved, one dares assign to an investigator the honorary title of Master (Klassiker), his productions must have been of such towering kind that they can be told about in few words. Perhaps the greatest, in any case the scientific achievement that will forever be associated with the name, Martin Fischer, has to do with that foundation problem in biology which concerns itself with the forces responsible for the absorption and the movement of water in the organism. To judge properly what he accomplished here, it is required that the status of the question at about the turn of the century be recited.

Martin Fischer's Lasting Contribution

"The lasting contribution of Martin Fischer is his proof—based upon broadest experimental foundation—that the entire situation is the exact contrary, to all former medico-chemical ideas. The dominant constituents for water absorption are not the highly dispersed fragments of protoplasm, but *per contra*, its colloid constituents. The forces of (classical) osmosis and of diffusion as characterized by molecular concentration and diffusion velocity are not those primarily active in water transport, but the water holding powers characteristic of the hydrophilic colloid itself, known, also as its forces of swelling and solvation. The colloids of protoplasm are the seat of these forces, not the highly dispersed constituents dissolved in its water. The latter of course, also play a part, but not that direct one of inherent osmotic activity but an indirect one—they combine with the proteins of the cell, to form new complexes, according to Martin Fischer, which in their capacity to hold water differ fundamentally from the electrolyte free proteins. The laws that govern this phenomenon of swelling (as observed in part by F. Hofmeister on dead gelatine plates) may be rediscovered, often with unbelievable accuracy, in the phenomena of water absorption and secretion by the living cell, yes, even in the water-holding capacity of entire, circulationless organs removed from the complex bodies of the higher animals, as frogs legs, eyes, etc.

"With the presentation and development of this colloid-chemical theory of water absorption in the living system, Martin Fischer set the entire problem upon fundamentally new physico-chemical bases. It is a matter of secondary importance in how far some of the many details of his theory as orginally proposed are still acceptable or not—whether, for example, it is a new production of acid, of organic bases or of ferments

under pathological circumstances that is responsible for the changes in water metabolism observed in edema and nephritis. It is of secondary importance, too, if for this water-holding capacity (as for that of the blood) a new term like 'colloid-osmotic pressure' be preferred to solvation pressure. This 'swelling of "sols"' has been the subject of scientific discussion since 1911. The question of in how far 'onkotic pressure' and 'swelling pressure' are identical is also a secondary matter; or whether the excessive swelling in given instances of edema concerns first the connective tissue or first the cell protoplasm. Important only is *this fact*, that colloid-chemical variables govern the dynamics of water metabolism and this not merely because added to osmosis, diffusion, hydrodynamic change, etc., but in most instances, because exclusively at work; in short, it is no longer the salts but the colloids of the organism which by their kind and state determine an existent physiology or pathology.

Martin Fischer Unseats Infinite Dilution Supremacy

"The second fundamentally new idea of Martin Fischer is closely associated with what has been detailed. The large quantity of water present in the cell has, for decades past, led to the belief that physical chemistry of the dilute solution might without hindrance be applied to the living cell to explain its behavior. Again, through arguments based upon unnumbered experiments, Martin Fischer proves that it is a mistake so to regard protoplasm in this classical physico-chemical sense. What is analyzed out of colloid systems as water is by no means the measure of what they hold free. By swelling and solvation enormous quantities are bound, wherefore many reactions such as indicator changes, displacements in chemical equilibria in the direction of synthesis, etc., appear in protoplasmic systems only as observed in the concentrated systems of the test tube."

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Martin Fischer and Louis Kahlenberg Faced Things Experimentally

This infinite dilution debacle sounds like the iconoclasm of Kahlenberg, a student of the elder Ostwald. Some will remember Kahlenberg's great lecture about 1907 before the American Chemical Society (Chicago Meeting), upon conductivity of living membranes. Fischer was prob-

ably there to hear Kahlenberg say, "I decided to test the matter on myself to see if I could drive lithium as tracer element into my urine and how quickly. So I placed my feet in a solution of lithium chloride containing one electrode and put the other electrode in my mouth. I detected lithium in my urine as quick as I could get ready to make the test" — which brought down the house. (A great audience indeed.),

Martin Fischer also Collided with the Great Limitations of the Scientific Mind — and Survived

He lives and is here to tell the tale. Again quoting Wolfgang Ostwald—now the philosopher:

"Familiarly, four stages appear in the reaction of the scientific public to any really original and so immediately uncomfortable idea. A first ignores it at times because without interest on account of mental laziness; commonly enough, however, with intent. A second makes violent attack, declaring the new idea absurd or fundamentally false. Third, when the correctness and the fruitfulness of the idea cannot longer be denied, it is then pointed out that, after all, it 'was not new'. Wasn't it obvious, for example, that this or that author indicated it all 'between the lines'? The fourth and sublimest reaction appears when the experts in the field declare the idea under discussion as something, after all, self-evident. The tableau is set forth in Schopenhauer's words: 'The truth is granted but that brief moment of victory which appears between the time at which it was laughed at as absurd and that in which it is cast aside as trivial.' "

Martin Fischer's theory that the biocolloids are in and of themselves the dominant purveyors of water metabolism in the living organism has weathered all these stages. Yet each may still be seen rampant even today. But this is all too clear—it is the fourth, the sublimest of the stages, that holds the field. No larger or newer work in physiology of water metabolism now fails to direct attention to the colloid-chemical variables present in the problem. Compare herewith the corresponding chapters in the textbooks of twenty or thirty years ago, for example, those in the well-known volume, from the standpoint of classical physical chemistry, of R. Hober, which even in its latest edition when still content to call upon "vital factors," scarce refers to the colloid-chemical elements involved in water absorption. These modern monographs, commonly enough mention the name of Martin Fischer; but only rarely do they declare him the creator of this fundamental concept. It is lovely to be sure, when the ideas of anyone have become so intimate and important a portion of existent thought that the author has become of the anonymous; nevertheless, it remain the duty of editor and scientific chronicler, in spite thereof, to protest

and to announce again and again the name of the man to whom thanks are due for a turn in way of thought regarding a major problem.

Martin Fischer not merely Contributor to Biology and Medicine

Martin Fischer's contributions are not limited to biology and medicine. Exactly as Poisseuille, Adolf Fick, Wilhelm Pfeffer, and many another biologist created those chapters in pure chemistry or physics required by them for their biological purposes but found not ready-made, just so did Martin Fischer make contribution after contribution to pure colloid chemistry.

Then, too, Wolfgang Ostwald, son of the great Wilhelm Ostwald, saw much of human nature and of University life which afflict the original researcher. He knew what Martin Fischer was bound to experience. As a child he wondered why his father's American students didn't wear feathers and were not collecting scalps as all real Americans should.

He seems to have observed even in American Universities that the difference between a Hochschule and a true University could be early observed in whether the Emeritus workers were prevented from having seminar and research workers. This universal professional antagonism I used to warn my own students against by requiring the reading of the Autobiography of Benvenuti Cellini, that they might see the effort of great artists to prevent

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Cellini from securing commissions which would bring his work down to posterity, like the great golden salt cellar in the Metropolitan Museum of Art.

Rarely does one see such a keen appraisal of the soil of the scientist and of the University than that by Wolfgang Ostwald in showing how Martin Fischer survived these little souls.

But Wolfgang came from a great father who stood up in the Deutsche Electro Chemical Gesellshaft and prevented the great worker Klaason from keeping Edgar Fahs Smith from being invited to membership. When his enemies criticized his work it was referred to as that of Edgar Fahs

Smith, but when it had to be referred to as a successful method it was that of "E. Schmidt." It was again Wilhelm Ostwald who pulled the work of van't Hoff out of oblivion as the work of the "Dutch Horsedoctor."

Again it was he who defended the work of Arrhenius for his Ph.D. at Upsala or he would never have received it for his dissociation theory.

Martin Fischer Great Contributor to Colloid Chemistry Itself —Soaps

"Let his extensive measurements of swelling be recalled, his quantitative studies of the synergism of ions, his important experimental observation that swelling and solution in lyophilic systems follow different laws, his detailed laboratory studies of the emulsions and, especially, his systematic experiments on the soaps. The last named (of which, by the way, the German edition of his book, *Soaps and Proteins*, is sold out) set forth, perhaps, in purest form the experimentalist Martin Fischer. In amazingly systematic fashion he studies important colloid-chemical properties as they appear during the gelation of homologous chemical series—and this long before it became fashionable to study variation in chemical behavior in relation to particle size. The wealth of experimental facts alone found in these papers has not even been touched, for the foundation of theory. With eyes wide open for what is the universal in many colloid phenomena in both aqueous and non-aqueous solvents, he here showed how such special assumptions, as that of the Donnan theorem, for example, cannot be made responsible for the absorption of a liquid in a gel—simply because identical behavior may be observed in non-ionizing solvents. Here, too, he developed his much-copied diagram of reversal in phase relation as theoretical foundation for at least one great class of gelatin phenomena, making at the same time plenty of suggestions for the better understanding of some purely technological questions. It is all the scientific labor of an Antaeus, in purest, cleanest form that we find in these studies of Martin Fischer on soaps—studies always grounded in experiment and, for theory, never leaving the mother earth of observed fact.

Lyophilic Colloids

"Another series of important observations, carried out with Marion O. Hooker, are Martin Fischer's studies of the lyophilic colloids in general. Here he takes into the circle of his investigation not only proteins, soaps, inorganic colloids like silicic acid and the silicates in aqueous dispersion, but mixtures of substances of low molecular weight as phenol, quinolin, yes, even sulphuric acid with water. It requires detached spirit to be amazed when two liquids composed of nothing but phenol and water but in different proportions do not mix with each other. The normal-

ly minded physical chemist has, of course, long been aware of the fact, but he never got excited about it. Quite the reverse, this Martin Fischer! He points out that this seemingly paradoxical phenomenon must have its cause in a fundamental difference in the inner structure of the two component solutions making up the mixture. He characterizes it by saying that he believes them to be inverse to each other, as are, for example, the structure of a foam and that of a fog, which though composed of the same physical elements but in different concentration are able to exist unchanged beside each other and never to mix. By calling to his aid systematic conductivity measurements, he shows how close is this analogy between the behavior of typical lyophilic sols and these partially miscible fluid mixtures; whereafter he stresses the applicability of the theory to better understanding of numerous biological and medical problems, and also of some problems in technology, like that of paint preparation.

Martin Fischer Launches into the Fine Art of Painting

"There are, first, his papers on the technique of fine arts painting as put together in his volume, *The Permanent Palette*—a best-seller in the United States, the text in various art academies, etc. Martin Fischer is himself a painter—he sends his wares to exhibitions, gets medals for them, sells them even. He says that he inherited this love for the fine arts, that he follows in such serious fashion, from his father, who was a craftsman. He believes, too (in common, for example, with Wilhelm Ostwald), that painting in the open air is one of the best means of recovery from brain fag of scientific labor. In Martin Fischer's first publications are discoverable painstaking histological drawings which he executed not only to illustrate his own papers, but those, too, of his colleagues.

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Martin Fischer as Biographer

"A second field in which he has become prominent in later years is that of biography. In 1937 and 1938 alone he wrote two larger texts which cover the lives of the two doctors of medicine, Christian R. Holmes, the creator of Cincinnati's modern medico-educational and hospital situation; and William B. Wherry, the great bacteriologist who, among other things, discovered the bubonic pest in ground squirrels and the tularemic pest in man. Besides these, Fischer has written at least a dozen shorter biographies and tributes. When one reads the two larger volumes while remem-

bering its men (I knew them both) he is impressed not only of their solid content but of the sympathy and almost passionate devotion of Martin Fischer to the fate, the work, the spirit and the personality of two other human beings. Even so, Martin Fischer introduces these biographies with the quotation: 'Men write their own biographies.' When a man is able so to redraft the portrait of great men that the reader afterwards is not only informed but is haunted, moved, encouraged, instructed, is made to aspire—then this biographer has attained more than his goal of exhibiting clearly to a dull community the work of one man. He has become the portraitist of the many and the great. It shows example not only to his younger colleagues but to his older. Thus there is made active that greatest of pedagogical principles, invitation to imitation, able to bring to better fruit even the seeds sown in the garden of scientific endeavor.

Martin Fischer—Literary Master

"It is expressive of this same faculty of interesting himself in the life of another that we should find in Martin Fischer's literary index a whole series of critiques and translations—in part very long ones, which after unearthing, he himself translated into English—actually himself and not through his assistants, and with a conscientiousness, yes, a meticulousness characteristic of the operative surgeon.

Martin Fischer and Philosophy

"A man of such breadth of mind becomes a philosopher. He who observes and has understanding of the relation of things to each other, transcends the field of his scientific specialty and ends with a mental store defined as wisdom. Martin Fischer's numerous pupils and friends recognized this. There already exists a second and enlarged edition of Fischerisms, a collection of his aphorismic declarations issued by these pupils. We discover in this tiny volume sentences that start in humor to terminate in tragic, almost religious vein—chiding, genial, kindly beginnings followed by equally pungent, angry and annihilating ends. The spiritual level of these Fischerisms is not better evidenced than by pointing out that a colleague in this year used one of them as the motto introductory to his scientific volume. But Martin Fischer himself has known and loved since earliest years, as breviary with which to meet life's stony path, Gracian's *Manual of Worldly Wisdom*, just as did Schopenhauer himself make the first complete translation of the original Spanish text into German. Martin Fischer's loves, too, have always been of the realistic; never of the merely platonic. For which reason he taught himself Spanish, brought together what is at the moment perhaps the largest of Graciana libraries, himself finally, after truest philological investigation, to bring forth the ori-

ginal of Gracian's *Oraculo* in English translation. Appearing first in 1934 the little volume is now in its seventh thousand."

Some Fischerisms

"Make a diagnosis and get hanged for it. You can't sail a boat on your impression of where the north lies."

"The trouble with our world is that too large a fraction want nothing—and have nothing."

"Those who want nothing would die—if the bonus, the dole and the community handout would just stop."

"Sure you can Psychoanalyze, but as Baehr used to say, why bother to sort garbage?"

"You must be a Russian! He, too, spends all day arguing when five minutes of looking would settle the matter."

"The chemists work too much with fuming sulphuric acid. That's using an axe—and God doesn't use an axe."

"Essential hypertension is essential ignorance."

"pH is the sacred bull of modern physiology—and as such needs the tether."

"Water is a chemist's invention."

"Chemistry remains the purest of the sciences because it most consistently dumps the impurities down the sink."

Martin Fischer the Physician

"Last but not least, Martin Fischer is a most busy, practical physician. Appeals to him as internist and diagnostician come from New York to San Francisco, called for at times in special car. His lecture trips abroad are all too often broken by visits to the sick; and his work in the laboratory, by those who seek his counsel, hoping surely that here they can reach him. We all know of what comfort is not only the intelligent but the self-sacrificing and understanding physician to his fellows. What unnumbered sufferers, who invariably become his friends, have I not heard speak with tearful eyes of their doctor, Martin Fischer."

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Omissions

In order to teach or emphasize a few things, I have omitted many things about Martin Fischer. None of them to his discredit. I left out some to get in a few "Fischerisms."

Martin Fischer here knows many which we do not know. What a career of persistent application! Forty-seven years of colloid chemistry applied to physiology!

What a field for seminar students in places where graduate work is real and students are kept in the literature

problems throughout their whole work. A few decades ago we knew but a single variable in the role of water in physiology but our leader has changed all that by indefatigable work in the literature and the laboratory. What a host of publications has resulted!

Finally—the Man

"Martin Fischer always stood in the front line in the battle to utilize colloid chemistry—and after World War I when his colleagues in science were in distress he was found in the front line of rescue work for those in Hamburg, Kiel, Halle, Goettingen, Dresden, and Vienna. Wherefore it was written into the Christmas anthem of the students in the Liepzig Physicalische-Chemische Institute; der onkel aus Amerik ist weider mit viel dollars da; wir gruessen ihn—an dieser Stelle, empfehlen uns fuer guenft'ge Faelle!

"Some of those he helped were his outspoken scientific antagonists."

He even paid expenses of lecturers at his own University of Cincinnati, who were his strong scientific opponents.

May I make Wolfgang's words sincerely my own when he says:

"None of you regards me as particularly sentimental, nor will you attribute this to Schopenhauer, that steely thinker and hypertrophic intellectual—but a sentence from this philosopher runs, 'As torches and fireworks pale and become invisible in the sunlight, so the mind and even genius and beauty are outshone and over-shadowed by goodness of heart.' This is not a quotation from the Psalms or from some other gentle volume on education. It is out of *World as Will and Concept* . . . I have enjoyed the rare fortune of knowing personally and intimately a number of great intellects. I have discovered however, that the great mind and the great heart by no means always or necessarily go together. In fact, the hypertrophy of the one organ seems more commonly to come about through the atrophy of the second. If both organs attain a supernormal development we call the man a giant. Here that much abused word the 'worth' of a man to himself and to us fits." How true!

Let me unashamedly quote just two ascriptions when he sent me two of his books, as examples of how Fischer thinks of those he feels are his friends (and I wish I could add a letter from him). In a copy of "Fischerisms," "To James R. Withrow—to laugh—lest he weep. Martin H. Fischer."

In a copy of *The Lyophilic Colloids (Their Theory and Practice)*:

"To James R. Withrow, who has concept of the whole. Martin H. Fischer"—what a gesture of friendship!

From just one letter:

"Dear Dr. Withrow:

"How pleasant is any word from you to us who have so long been depend-

ent upon you to steer us and to make us happy in the day's work."

Where Martin Fischer gets such ideas, I do not know!

Now let me quote the words of Wolfgang Ostwald, in that great ovation to you in Germany long ago, for purpose of this Ohio Award:

"Stand up! dear Martin Fischer, friendliest of friends!

Show yourself to your old friends, and to those many new who when they know you will become such."

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Dr. Fischer Receives Ohio Award

DR. MARTIN Fischer, F.A.I.C., professor of physiology, University of Cincinnati College of Medicine, received the Ohio Award for 1952 at the Ohio AIC Chapter's meeting, held April 25th, at the Hotel Biltmore, Dayton, Ohio. The all-day meeting started with a plant visit to the National Cash Register Company, which then entertained the members at a luncheon. In the afternoon, AIC president, Lawrence H. Flett, spoke on the objectives of The American Institute of Chemists. At the Honor Award dinner, Dr. James R. Withrow, Hon AIC, discussed the accomplishments and character of the Award recipient (See page 371).

Dr. Fischer responded with an extemporaneous "series of tales of the great men who, in my travel through life, have changed the course of it." His combination of biography and philosophy was extremely interesting and exceedingly well-received. As Dr. Otis D. Cole,, chairman of the Ohio Chapter, commented later, "Those who did not attend this meeting missed real treats both in the plant visit (National Cash Register really rolled out the plush carpet) and the speaker of the evening. It is interesting to hear, at first hand, of the human side of some of the famous chemists whom most of us know or have known only in the literature."

To Europe: Dr. Robert S. Aries, F.A.I.C., consulting engineer, New York, N. Y., who attended the ACHEMA exposition in Frankfurt, Germany, where he spoke on new trends in the chemical process industries. He also visited clients in France, Belgium, Sweden, and England.

Consultant: Hillary Robinette, Jr, F.A.I.C., who has opened his own offices in Ardmore, Pa., as chemical consultant to business and industry. He has been research director of Amalgamated Chemical Corporation since 1948, and he will continue as consultant to Amalgamated on textile wet processing problems, paper chemistry, and leather chemistry. He was formerly manager of the new products division of Publicker Industries, member of the staff of the sales promotion division of Commercial Solvents Corporation, president of the W. H. & F. Jordan Manufacturing Company, and research chemist at Rohm & Haas Corporation, all of Philadelphia.

During World War II, Mr. Robinette served as captain in the research and development branch of the military planning division of the Quartermaster Corps. He was awarded the Army Commendation Medal.

Honored: Dr. Alexander Silverman, Hon. AIC, by the establishment of the Alexander Silverman Award at the University of Pittsburgh. This award consists of a membership in the American Chemical Society to be given by the Chemistry Faculty of the University to the student specializing in chemistry who has the highest honors during his first three years in residence. The winners for 1952 were Kay Sterrett of Monessen, Pa., and Carl Snyder of Pittsburgh, both of whom had straight A records and were tied for the award, which was made in duplicate. Dr. Silverman, who taught at the University for forty-six years, was head of the Chemistry department from 1918 to 1951, inclusive.

Elected: Dr. Stephen Laufer, F.A.I.C., director of brewing technology of Schwarz Laboratories, New York, N. Y., as president of the American Society of Brewing Chemists, at the annual meeting held in Toronto, May 4-8. He has been active in the society since its inception in 1934, as member and chairman of technical sub-committees, chairman of technical committee and editorial board, second vice-president and first vice-president.

Honored: Dr. Lloyd A. Hall, F.A.I.C., technical director of The Griffith Laboratories, Inc., Chicago, Illinois, who received an Achievement Award from the Phi Beta Sigma fraternity, at the Industry Conference at the U. S. Department of Commerce, Washington, D. C., April 19. Dr. Hall was cited for "his long, constructive and outstanding work in food chemistry." He has been with The Griffith Laboratories since 1924 and holds eighty-six patents, mostly applying to food products. He is a member of the Executive Council and a Councillor-at-Large of the Institute of Food Technologists.

Books on Chemistry—What the Educators Want

A. H. Blatt, F.A.I.C.

Queens College, Flushing, New York

(Presented at the AIC Annual Meeting, May 7th, as part of Concurrent Session C, "The Situation in Chemical Literature.")

THE teacher of chemistry in the college or university is by the nature of his work to be described either, favorably, as a jack of several trades, or unfavorably, as a personality split several ways. His primary responsibility is teaching chemistry and training chemists. In addition, to an extent depending upon his own temperament and upon the character of the institution of which he a part, he will be concerned also with the development of his students as persons and as future citizens. As a teacher he has the responsibility of keeping well informed about the status of and developments in the whole of chemistry—not in just the restricted portions of the subject in which he has particular interest. Ideally, of course, the teacher of chemistry also keeps informed of developments in related sciences, physics on the one side and biology on the other. The practical difficulties here, resulting from the enormously increased volume of material being published and from the failure of any one to figure out how to increase correspondingly the number of hours in the day, have been and will be dealt with by other speakers.

Finally the teacher of chemistry will also be doing research, either doing the research himself or *via* the medium of graduate students and post doctoral fellows. The many other activities that take up the teacher's time, for example, serving on committees and manoeuvering so as to avoid being put on committees, are not relevant to our discussion.

For each of the three relevant functions—teaching, keeping informed of developments in chemistry and related subjects, research—the teacher has need of books. For research, however, the teacher's need of and interest in books are identical with those of other research chemists.

As a teacher the academic chemist will need textbooks. This statement I must qualify by limiting its application to the first courses in the various areas of chemistry; for example, the first year's work in general chemistry; the first year's work in organic chemistry; the first year's work in physical chemistry. I shall have a word to say about textbooks in advanced courses later, but the discussion of textbooks that follows immediately refers to these first courses.

What do we want of textbooks? Let us begin by being completely practical. We want the textbooks to

be reasonably priced. The student takes several courses in any one semester. In some courses there will be laboratory manuals as well as textbooks required. When the prices of these books mount to between five and ten dollars each, the total cost becomes a real problem. I know that the publishers are doing what they can to meet the problem of rising costs. You will doubtless hear more on this problem later when we hear from the publishers. All I need do is point out that the price of textbooks is a serious problem.

Closely related to the cost of textbooks is their size. From my own experience I can assure you that it is more difficult to write a short book than a long one. The temptation is to include more and more material. I feel strongly, however, that the author should not evade the responsibility of making decisions as to what is important and what is not by including everything that might be of interest to every teacher who may use the book. Some textbooks are quite unrealistic with respect to size; a book that contains 800 to 1,000 closely printed large pages is too big for use in a course that meets three times a week for an academic year—roughly between seventy and eighty class meetings when you allow for holidays and examinations. You sometimes find in addition "Suggested Readings" at the end of each chapter which will run as high as 300 pages and which may involve one or two languages in addition to English. One wonders whether the author has given thought to the facts that the student is taking at least three and usually four other courses at the same time and that the particular course for which the textbook was written is not the only interest in the life of the student—though it may be for the author.

The reverse of the textbook that is too large and too inclusive is the textbook that is built too closely upon the course given by the author. Good textbooks are not written by someone who decides one day to write a textbook and thereupon does it. A good textbook develops from a good course and it represents the author's accumulated experience about effective ways of organizing and presenting the material involved. But it must be remembered that what is the best course for one instructor is not the only course and may not be the best course for another instructor. In other words the textbook should be an aid to the instructor, not a substitute for an instructor. Stated somewhat differently, the textbook should reflect the author's experience and at the same time give adequate freedom to the instructors who use it. The limits between which the author works follows from what has been said: he must avoid making the textbook too restrictive on others and he must avoid making the textbook so generally applicable that it becomes characterless.

Implicit in what I have been saying

are some ideas of the way in which a textbook is to be used. Any adequate discussion of this point would take us too far afield and would require much more time than is available, for the ways in which textbooks are used will vary with the course, the instructor, and the institution. The one use of the textbook that I believe is common to all instructors should, however, be mentioned. The textbook frees the instructor from the necessity of reciting a body of experimental observations and descriptive material and provides the student with a convenient reference source for this information. In this way the instructor is free to spend more time on topics which, from his experience, he knows require repetition and exposition from more than one point of view.

It is important that the textbook represent a certain amount of scientific maturity on the part of the author. He should recognize the relationship between experiment and theory, he should be aware of the distinction between theory and rationalization, and he should realize that the student may not recognize and be aware of these relationships and distinctions. Another aspect of this same requirement is that the textbook should make clear that chemistry is a living and growing subject, not one that is complete and static. It is most unfortunate when a student gets the impression from his first text in a field that we all know all the answers, and then finds in an advanced course that we know very few.

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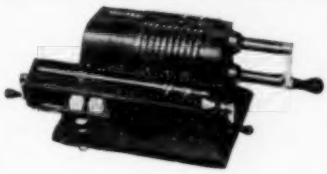

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Such obvious requirements of a good textbook as that it be reasonably up to date and free from serious inaccuracies I need only mention before passing to the advanced courses—those courses customarily listed in university catalogs as open to properly qualified seniors and to graduate students. I feel reasonably certain from conversations with publishers' representatives that the publishers will not agree with what I shall have to say. For, excepting skill courses where procedures and methods must be described in detail, I see little justification for the textbook in an advanced

course in chemistry. Or to reverse the emphasis, if you can justify the textbook in an advanced course you will find it difficult to justify the instructor. This does not mean that the advanced course will be given without the assistance of books. Extensive use will be made of advanced treatises and monographs for reference assignments. But the advanced course should be based so largely by the instructor on his own study of original journal articles; and so much of the content of an advanced course should change from year to year as new work is published in the journals, that it is undesirable to freeze the work of such a course into print. The advanced course, in other words, should be too personal an affair and too close to the original publications to justify a textbook.

Finally we come to the problem which the teacher faces in keeping informed of developments in chemistry and related subjects. As you are all aware, the volume of original work has become so large and its content has become so specialized that it is all one can do to follow such work in one field of chemistry, say organic chemistry or physical chemistry. I can recall from my own experience that twenty years ago I could follow *Chemical Abstracts*, regularly read some half dozen journals for their articles on organic chemistry, and in addition, read articles in other fields of chemistry. This I can no longer do. And I don't believe that I read more slowly now than then. For other areas in chemistry than one's field of special interest and for other subjects than chemistry, the teacher is forced to rely on reviews—*Chemical Reviews* and the various annual reviews published in this country; the *Annual Reports* and *Quarterly Reviews* published in England — and on advanced treatises and specialized monographs. The advanced treatises and specialized monographs that are being published are, I think, excellent. The difficulty is not in the quality of the books but in their availability. The current inflation has not reached academic salaries or the funds available to college and university libraries. In one recent week I received publishers' notices of four advanced books that I want to read and study and which I should read and study. They were priced, however, at $9.00, $12.00, $16,00, and $17.00 respectively. Now $54.00 is a sizeable book order for an individual, and for a college library as well when it is recalled that similar requests are coming in from others in the chemistry department and from other departments. I personally prefer to have my own copy of a book I want to study rather than to depend on the library, but it is becoming necessary to change my habit and use not only the college library but other libraries as well.

Now let me summarize. The teacher has need of textbooks which are of reasonable size and price, written to

help the student and the instructor and not to take the place of the instructor. He also needs advanced treatises and specialized monographs in order to keep informed of work in chemistry generally and in related subjects. These advanced treatises and monographs are available but at prices that are beyond the means of many potential users.

Honored: Dr. William D. Coolidge, F.A.I.C., retired vice-president and director of research of General Electric Company, who received the first K. C. Li Medal "for meritorious achievement in advancing the science of tungsten," from Columbia University, May 20th. The award consists of a gold medal and $1,000. Dr. Coolidge pioneered and developed the method for obtaining ductile metallic tungsten, which made possible the electric light bulb filament. The award is made in alternate years from a fund established by K. C. Li, chairman of the Wah Chang Corporation, New York, N. Y.

Radiochemicals Division: Established by Bjorksten Research Laboratories, Inc., at Madison, Wisconsin. Dr. Johan Bjorksten, F.A.I.C., president of the Laboratories, stated that this new division marks the return of Dr. Howard L. Gottlieb, F.A.I.C., from studies at Oak Ridge, Tennessee, and that Dr. Gottlieb will direct the Division.

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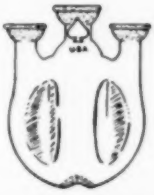

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Progress: In food production, reviewed by Dr. Roy C. Newton, F.A.I.C., vice-president in charge of research, Swift & Company, Chicago, Ill., when he received the 1952 medal of the Industrial Research Institute for "outstanding accomplishment in leadership in and management of industrial research," May 6th.

"The more fudamental studies which provide the basic knowledge of Nature's things, and the laws which govern their behavior, will be the guide to greater production," Dr. Newton declared. "Further improvement in our standard of life can be achieved only by extending our research effort."

Retailer: For the first time in its fifty-one-year history, Monsanto Chemical Company, St. Louis 4, Mo., which is offering Krilium soil conditioner directly to the public on a nation-wide basis. As production is increased, and as dealers complete their stocks, the initial mail-order arrangement will be discontinued.

Honored: By Universal Oil Products Company, Chicago 4, Illinois, more than eighty-five employees who have had twenty-five or more years of service with the company, at a reception and dinner, May 2nd, at the Blackstone Hotel, Chicago. Among these employees were vice-presidents, Professor Vladimir Ipatieff, F.A.I.C., and Dr. Gustav Egloff, Hon. F.A.I.C.

Conservation—Its Role in the Defense Program

Blodgett Sage, F.A.I.C.

McLean, Virginia

AT ONE time, the word "conservation" brought up visions of somebody making the rounds to shut off lights, close windows and turn down the radiators. And don't forget that immortal line, "Woodman spare that tree." Even today, many people don't understand what conservation is. Just recently a prominent official was asked to serve on a conservation committee. His answer was: "Why should we be interested in bird life?"

Now industrial conservation is not quite bird life. World War II changed all that. At the start, quantity and speed were the watch words; never mind the waste—get the orders out so we can win the war. Then, in quick succession came materials shortages, manpower scarcities and machine tool deficiencies. There wasn't enough of anything to go around.

The defense program has forced a new concept of conservation as recurrence of those conditions has threatened. Conservation is no longer a stepchild of production. It means more effective utilization of materials, products and facilities including reduction and elimination of preventable waste, so we can have more. Although it goes under many different labels, conservation follows the methods of more frugal design, better processing, quality control, utilization of by-product, improved maintenance, and measures which extend the availability of scarce materials through the techniques of standardization, substitution, simplification, specifications, salvage and reclaim.

Today, conservation is an important function of materials management. It is not a phase limited to the national emergency, nor should conservation be confused with scrap drives or limitations on use. When the time comes that materials are more freely available and competitive costs must be reduced, then waste control, materials salvage and the techniques of conservation will assume an importance that will demand as much attention from management as is accorded improvement in manufacturing processes. Our materials resources are not inexhaustible, and in many materials, the United States is a have-not nation. How else explain the stockpiling program and Defense Materials Procurement Agency in government, as well as the "Materials Committees" and "Vice Presidents for Materials Supply" which have been established in a number of forward looking corporations?

In the defense effort conservation activities are positioned in the De-

fense Production Administration's Conservation Division. This group is charged with planning and developing programs and projects to promote savings of scarce and critical materials, and to be the focal point for conservation recommendations for action by the Defense Production Administration and other federal agencies. The Division also provides staff assistance to the government's Conservation Coordinating Committee which is composed of representatives from 18 government agencies which have to do with materials and facilities. Decisions of the Committee are made effective through its members who get action back in the agencies' offices. From this it can be seen that the government is expected to be the first to conserve and not the last.

In industry, programs are fostered through the assistance of Chambers of Commerce, Trade Associations, and manufacturers who sponsor programs in conjunction with labor leaders through poster campaigns and exhibits which encourage employee participation. Voluntary cooperation is stressed!

When the United States adopted its policy of making itself and its allies strong, the military take of steel (as an example) was a minor percentage of total output. Immediately foreseen requirements might raise the military take to about 10 percent (arbitrarily assumed figure) which could be met through utilization of the steel industry's full capacity and without particular disturbance to the civilian economy. Issuance of preference delivery certificates would assure meeting the essential requirement for national security and still leave 90 percent of increased output for civilian usages.

However, it became apparent at once that the supporting industries also would require preferential status, so provision had to be made for Transportation, Agriculture, Defense and Hospital Construction, Mining, Maintenance and Repair Supplies, Canadian Industry, Foreign Allies, etc. If, to complete our example, we assign to each of the above industries an arbitrary 10 percent take from the total available supply, then it becomes apparent that the civilian economy is squeezed down to getting along on 20 percent of its former consumption of raw materials instead of the 90 percent of increased output that was envisioned in the preceding paragraph.

To meet this situation a modified controlled materials plan (CMP) was put into operation to assure that essential programs receive a proportionate share of the available raw materials. This CMP plan rests on the triangle: steel, aluminum and copper, materials which can be observed from source through fabrication to the end products. The modern economy is so intricate that complete control is out of the question, hence these three

metals have been selected as bellwethers which set the pace. So, in accordance with the amounts of steel, aluminum and copper allotted to each defense program or segment of the economy, all other industries automatically will gear production thereto.

The crux of the matter is the old law of supply-demand (requirements). The equation is out of balance because the needs of the defense program superimposed on top of normal civilian needs pushes total requirements way ahead of supply. There are two ways to balance this equation: one is to increase supply, and the other is to decrease requirements. Both methods are being used. U. S. industry is increasing production, and conservation is lessening the pressure of requirements.

In the early stages conservation reduces requirements by finding substitutes and alternatives for materials in short supply. As these possibilities are exhausted, and the supply still remains inadequate, the techniques of conservation reduce requirements through savings at the source, revision of specifications, and reduction in the number of sizes and varieties, i.e., through standardization and simplification. Savings at the source are accomplished primarily by re-design. Industry is asked to see what it can do to cut down requirements, particularly of critical materials, through re-design of the product. This includes what is called downgrading or "leaning-down" the alloy content in steels.

Standardization and specifications are developed for interchangeability and for sub-contracting. Without broad interchangeability and specifications, neither large scale sub-contracting nor replacements can be taken care of. Then there is simplification which makes it possible to save tremendous amounts of material and free

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up facilities for other pressing uses. By geting rid of specialties in which there is no turnover, quantities of material tied up in work-in process and idle inventory are saved for more urgent needs. In the valve industry, the line of products was cut 50 percent in World War II and still the industry was able to take care of all end requirements. This process not only reduces the number of items, but frees machines, and cuts down warehousing and shipping problems.

In the field of substitutions there are many examples. Quite often the substitute, or alternate, proves superior to the original material. Right now the automotive and electrical equipment industries are working on reducing their requirements of copper. These steps take time for redesigning and testing, but both the availability and quality of the alternate materials and their relative economies of production will determine ultimate usages of copper or substitutes such as aluminum.

Conservation also develops ways to stretch available materials. Experiments are now under way to determine the utility of a new bi-metal which is a steel core with copper overlay. The copper is welded to one or both sides of a steel slab and then rolled to desired thickness. If one starts with a 90 percent steel-10 percent copper slab the rolling results in a sheet of 90 steel-10 copper, no matter how many times it is rolled, or how thin the final sheet is. This copper-clad process could provide a substantial source of sheeting for the building trade, the automobile industry and wherever copper corrosion resistance is required.

Glass pipe is a feasible substitute for copper and stainless steel pipe and tubing. It can take care of high temperatures and high pressures, and has astounding shock resistance. This can be a very great source of saving strategic alloying metals. Another substitution project consists in using cast iron backs for railway journal bearings instead of solid bronze. Experimental cast iron journal backs are now installed in some six hundred freight cars undergoing service tests. If successful, this will mean releasing thousands of tons of copper to other defense uses.

Materials management may be illustrated by a project now under way called "redistribution of surplus inventory." In plants all over the country there are many materials that have been purchased in the past but for one reason or another were not used—just idle forgotten inventory. By digging out these idle materials and listing them for re-distribution to concerns that can't get delivery from regular suppliers, we will be utilizing a mine of invaluable existing material. Some very successful trial runs of this project have brought to light an astonishing quantity of strategic materials, including copper

and stainless steel that were available for re-distribution to those in need of these materials.

Returning to the Conservation Coordinating Committee, this group has a number of active sub-committees which are concerned with: construction, here building construction practices are being reviewed to eliminate waste so as to assure minimum use of controlled materials and to promote frugal design. This committee has rendered notable assistance in increasing the school building program in the face of material restrictions. The committee seeks ways and means of continued savings which will be beneficial even after the present material stringencies are past.

Other sub-committes are concerned with copper conservation; critical alloy substitutes; Molybdenum-Nickel conservation; Products from Woodwaste; Interchange of conservation information between the United States and other countries. Abroad, the need for conserving materials has developed practices that have received scant attention in the United States where production has proceeded chiefly under the idea that materials are inexhaustible.

In the United Kingdom, they are doing some amazing things in conserving sulfur. This information is now being made available to the subcommittee on Sulfur in the Defense Production Administration. Few people aside from chemists realize the enormity of the task facing this subcommittee. The importance of sulfur is not generally realized because it is a processing material which does not challenge popular interest as does an end-product. The problem is being attacked by this sub-committee of representatives from all government agencies concerned with sulfur, by promoting measures which will recover sulfur now wasted: encouraging use of mixed acids for fertilizer production; urging fertilizer mixers to concentrate on production of standard ratios which will eliminate odd mixtures that tie up sulfur in slow moving inventories; furthering measures for recovery of sulfur from by-product gases and initiating a use incentive to spur sulfur recovery from industrial pocessing wastes.

What of the part of the chemical industry in this conservation movement? Ingenuity in using substitutes and trying alternatives are nothing new to the chemist—they are part of his daily life. Standardization and simplification are ingrained in chemical processing, but concentration on standard end-products may be found to be of advantage if attention is given to seeking them out. Containers can be simplified as to variety of size and number. When military shipments start delivery in volume, the container situation could demand attention almost overnight. Vehicles must be conserved to extend their life through careful maintenance and operation.

In construction, the scarcity of metals will force consideration of alternatives that may be used beyond the present excellent uses of glass and coated pipe transmission line. Salvage and reclaim will be intensified through greater attention to recovery of by-products from operations.

The chemical industry will develop its own conservation programs which though possibly not as spectacular to the general public as the conservation of consumer objects, will be the result of a distinctive type of viewpoint which is different from normal production thinking. Production has troubles of its own in obtaining the flow of raw materials, processing and shipping. The conservation viewpoint concentrates on making the most effective use of the materials. It asks: how can they be stretched or used to best advantage so that waste is eliminated and more production achieved?

We are not known as a thrifty nation. We have not had to be. But the realization that material resources are not inexhaustible is impinging on our consciousness. Recent cutbacks in military requirements because of the lengthened time for the defense program does not mean that materials will become so plentiful that conservation is out the window. Military conservation programs, the active cooperation of prominent technical organizations and the regional industrial meetings and conservation campaigns are indicative that there is a growing awareness that materials shortages give evidence of being with us for a long time. The D.P.A. publishes periodically a "List of Basic Materials and Alternates." The "by request" circulation of 90,000 copies shows that others are aware of the need for conservation.

Regional conservation meetings have been held in four cities, each meeting attended by representatives from about 60 factories. Active conservation campaigns were immediately started in each case. One company having 15 plants employing 45,000 people started a three-month conservation campaign. Committees were appointed, a slogan devised, the necessary background scenery of posters and exhibits was devised and prizes offered. At the end of the three-month period, the results were reviewed, taking into account whether there were any dollar savings discernible. It was found that in one month alone a saving of $178,000 could be traced.

This is a matter that both the chemical industry and its customers should be deeply interested in. Conservation ought to be a watchword and a philosophy in our country. Through conservation we can make available very large quantities of materials, which means more products, more employment, more business, more for everybody. Conservation is no longer just a label for "waste not, want not"; it's full of action, encour-

aging and stimulating improved operations through most effective use of manpower, materials and machines.

(Any opinions expressed in this article are those of the writer and do not necessarily reflect the policy of the Defense Production Administration.)

Appointed: Thomas C. Dabovich, M.A.I.C., as sales manager of the Industrial Chemical Division, J. T. Baker Chemical Co., Phillipsburg, N. J. He joined Baker in June from Sharples Chemicals, Inc., Wyandotte, Mich., where he was western regional sales manager. He received the B.S. degree in 1939 from the University of Illinois, and did graduate work at Northwestern and De Paul Universities.

New Position: Washington Hull, F.A.I.C., has joined the organic research staff of Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. He was formerly with the Railway Consulting Engineers in charge of their protective coatings and adhesives department. Prior to that, he was an organic research group leader with American Cyanamid Company.

First Annual Award: Of the Society for Applied Spectroscopy, was presented, May 22nd, to Dr. William L. Meggers, of the National Bureau of Standards.

Careers Ahead!

THE Chemist, May 1952 (page 213-214), listed those who were chosen by the AIC Chapters to receive Student Medals in "recognition of leadership, excellence in scholarship, and character." Since that issue went to press, the following additional students have been similarly recognized by several Chapters:

Ohio Chapter

James N. Baptist
Case Institute of Technology

Robert C. Griffis
Western Reserve University

Eugene Austin Gschwind
Ohio Mechanics Institute

Thomas A. Orofino
Kent State University

Los Angeles Chapter

Lester H. Quint
The University of Southern California

Washington Chapter

Brother Godfrey O'Neill
The Catholic University of America

John W. Stanford
The University of Maryland

Allen William Saunders
Howard University

Invitation: To AIC members, from Nicholes L. Dodge, F.A.I.C., who is now established in Santa Rosa, California, to "drop in with or without warning, and enjoy the hospitality and scenery at the 'Gateway to the Redwood Empire.'" Mr. Dodge, who resigned from Glyco Products Company, Brooklyn, last year after fifteen years of technical service and sales, is now constructing a service and development laboratory at 2110 Manzanita, Santa Rosa, for use primarily in industrial and agricultural fields. Warehousing, compounding and light chemical manufacturing facilities will be made available as required.

Appointed: Frank E Hamerslag, F.A.I.C., as executive assistant to the director of Wyeth Institute of Applied Biochemistry, Philadelphia, Pa. He was formerly chief chemist, Fratelli Branca and Co., Inc., New York, N.Y.

Scholarships: Established by Charles Pfizer & Co., Inc., Brooklyn, N. Y., consisting of $1,000 each for the seventy-two accredited medical schools in the United States. Dr. John E. McKeen, Hon. AIC, states that the program is designed to supplement other activities of the Pfizer Student Program which gives summer employment to medical, dental, pharmacy and veterinary students.

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Chemist Engineer: Dr.phil, Dr. eng. summa cum laude. Age 52. Twenty-eight years experience in management and developing chemical ,metallurgical processes and equipment. Numerous inventions practiced and pending. Responsible position for developing, consulting, trouble-shooting desired. Box 80, THE CHEMIST.

Chemical Engineer, F.A.I.C., Licensed. Experienced engineering administrator. Six years chief engineer supervising design, construction, maintenance, plus six years production, process development, research. Distillation, fermentation, chemical industries. Age 35. Box 810, THE CHEMIST.

Engineer, M.E., M.S. Age 34. Diversified background in chemistry and engineering sciences. Interested in position with challenge in research and development. Box 88, THE CHEMIST.

Biochemist, F.A.I.C., M.S. degree. Age 37. Fourteen years experience. Prefers Metropolitan N. Y. area. Salary desired $4,000 minimum. Box 84, THE CHEMIST.

Chemist, M.S. 1947. Five years experience: Formulation, evaluation and basic research principally in surface and colloid chemistry, i.e. soap and detergent field. 5 patents pending. Box 86, THE CHEMIST.

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National Council Meetings

Meetings of the AIC National Council are scheduled to be held at The Chemists' Club, 52 East 41st St., New York, N. Y., at 6:00 p.m., on the following dates:

September 10, 1952
November 12, 1952
January 14, 1953
March 11, 1953
April 8, 1953
May 11, 1953

April Meeting

The 281st meeting of the National Council, AIC, was held April 9, 1952, at 6:00 p.m., at The Chemists Club, 52 East 41st St., New York, N. Y. President Lawrence H. Flett presided.

The following officers and councilors were present: J. R. Bowman, C. L. Brown, C. C. Concannon, M. L. Crossley, G. J. Esselen, L. H. Flett, H. B. Hass, F. A. Hessel, C. P. Neidig, D. Price, F. D. Snell, L. Van Doren, F. E Wall, and L. T. Work. C. A. Amick, J. W. Perry, B. Sweedler, and V. F. Kimball were present.

President Flett announced that the New Jersey and the Washington Chapters were awarding Honor Scrolls this year for the

first time. He reported that he had attended the meeting of the New England Chapter at which Honorary Membership was presented to Dr. Hill. He announced that the 1952 Ohio Award was being presented to Dr. M. H. Fischer. He called attention to the program of the Annual Meeting, and the number of activities which were available for the price of registration alone. A vote of praise was given to O. B. J. Fraser, chairman of the Program Committee of the Annual Meeting, for the excellent program which he had prepared.

President Flett stated that the INSTITUTE had been represented at important installations, dedications, and on committees, during the year.

One of the matters which has concerned the Council is the present shortage of scientific manpower and at the same time the apparent inability of worthwhile men to find employment where their abilities can be fully utilized.

The Treasurer's report was presented and accepted.

The Secretary announced with deep regret the following deaths: William McPherson, Hon. AIC, on October 2, 1951; Charles F. Longfellow, F.A.I.C., January 30, 1952; W. S. Calcott, F.A.I.C., February 15, 1952; Thomas N. Deutz, F.A.I.C., March 3, 1952; William J. Lenz, F.A.I.C., August 4, 1951; John B. Ekeley, F.A.I.C., November 8, 1951; and H. P. Banks, F.A.I.C., December 26, 1951.

The Secretary reported that the present membership of the INSTITUTE is 2497.

The report of the Committee to Study the Problem of Retiring Members was read. It was decided to set up a Committee to study the requirements for an emeritus membership.

The report of the Committee on Ethics was accepted.

Dr. Esselen presented the report of the Committee on Honorary Membership. Three recipients were suggested for Honorary Membership in 1952-1953, their names to be announced at the Honor Recipients' Luncheon to be held on May 8th. (See page 370).

Mr. Sweedler reported as the delegate to represent the INSTITUTE on the Coordinating Committee for support of the Reed-Keogh Bill for retirement benefits. The bill was summarized as one which permits self-employed persons to set aside retirement funds, under certain conditions, which shall be tax-exempt until they receive the benefits. The Council approved the principle of the bill. President Flett appointed Mr. Sweedler as chairman of a steering committee on the Reed-Keogh Bills, with permission to select other members.

Dr. Hass reported that the New York Chapter's Student Medal meeting, March 20th, had a capacity audience. He stated that the New York Chapter's employment project is seeking funds from industry to get started, and after that, it is expected to be self-supporting. He announced that Dr. Foster D. Snell, former AIC president, will receive the Chapter's 1952 Honor Scroll, May 22nd.

Dr. Brown reported that the New Jersey Chapter would visit the Thomas A. Edison Laboratories in West Orange, N. J., in April. On May 21st the first Honor Scroll of the Chapter will be presented to Dr. Frederick A. Hessel.

Dr. Perry stated that Honorary Membership was presented to Professor Hill, by the New England Chapter at an intimate and successful meeting. A joint meeting is planned with another society in the near future.

Mr. Neidig reported that the Pennsylvania Chapter meeting in February was well attended, and that a Student Medal Meeting would be held in May.

Mr. Concannon reported that Mr. Markwood had recently returned from Europe and had presided over a successful luncheon meeting of the Washington Chapter. The first Honor Scroll of the Washington Chapter will be presented to Dr. Gordon M. Kline. The Washington Chapter's Civil Service Committee has issued a report on Civil Service Standards, which was referred to the Council for the May meeting.

The following new members were elected:

FELLOWS

Waggaman, William H.
Chemical Engineer, Office of Program and Requirements, Defense Production Administration, G.A.O. Building, Washington, D. C.

McIntosh, William James
Vice-President, Chief Chemist, Plant Manager, Haeuser Shellac Co., 52 Warren St., Brooklyn, N. Y.

Roberts, Richard R.
Head of Analytical Department, Chas. Pfizer & Co., Inc., Groton Plant, Conn.

Alstadt, Donald Martin
Senior Research Engineer, Engineering Research Division. Lord Mfg. Co., Erie Pa.

Bobalek, Edward G.
Associate Professor of Chemistry, Case Institute of Technology, Cleveland 6, Ohio.

Burch, Joseph Eugene
96 Whitehall Avenue, Buffalo, N. Y.

Campbell, Charles Russell
Chemist, Tung Oil Division, Crosby Forest Products Co., Picayune, Miss.

Collins, Gordon Hoge
Assistant Division Purchasing Agent, Purchasing Dept., E. I. DuPont de Nemours & Co., Wilmington 98, Delaware.

Doheny, James J. Jr.
Manager (Executive Secretary), Chicago Section, American Chemical Society, 86 East Randolph St., Chicago 1, Ill.

Gayer, Frederick H.
Consulting Chemist, 70 E. 23rd St., Chicago Heights, Illinois

Hochman, Harry
Assistant Biochemist, Dept. of Radiology, U.C.L.A. Dept. of Radiology, Tumor Control Center, Veterans Administration Center, Los Angeles 25, California

Matt, Joseph Z.
Research Chemist, Central Research Dept., Armour & Co., 1425 W. 42nd St., Chicago 49, Illinois

Nesty, Glenn Albert
Assistant Director, Central Research Lab., Allied Chemical & Dye Corp., Morristown, N. J.

Roberts, Ovid E. Jr.
Industry Commodity Analyst, National Production Authority, Washington, D.C.

Rosenthal, Fritz
Senior Research Chemist, Technical Dept., Nashua Gummed & Coated Paper Co., Nashua, N. H.

Sinclair, Gilbert E.
Technical Sales Service, Braun Corp., 2260 E. 15th St., Los Angeles, Calif.

Tishler, Max
Associate Director of Research & Development, Merck & Co., Inc., Rahway, N. J.

Von Bergen, Fritz
Market Development, Westvaco Chemical Div., Food Machinery and Chemical Corp, 405 Lexington Ave., New York 17, N. Y.

Bacon, Raymond F.
500 Fifth Ave., New York 18, N. Y.

Gerhart, Howard Leon
Director of Research, Paint Division, Research Dept., Pittsburgh Plate Glass Co., 235 E. Pittsburgh Ave., Milwaukee, Wis.

Feuchter, Harold W.
Manager New York Office, Sales, J. T. Baker Chemical Co., 122 E. 42nd St., New York 17, N. Y.

MEMBERS

Bragdon, Robert Irving
Analytical Chemist, Marden-Wild Corp., 500 Columbia St. Somerville 43, Mass.

Gerber, Walter J.
Chemist-Lubrication, Curtiss-Wright Corp., Metals Processing Div., Buffalo, N.Y.

Sturm, Bernard Junior
Chemist, ANP Project, Materials Chem. Div., Oak Ridge National Labs., Oak Ridge, Tenn.

Welles, Ernest
Research Chemist, Research and Development Dept., Permatex Co., Inc., 1720 Ave. Y, Brooklyn 35, N. Y.

ASSOCIATES

Meeker, James Edward
Chemist, Environmental Health Center; Phy. & Chem. Sec., United States Public Health Service, 1014 Broadway, Cincinnati, Ohio.

Douty, Charles Frank
Chemist, Research & Development National Aniline Division, 1051 South Park Ave., Buffalo, N. Y.

Hoffman, Walter Jerome
Chemist, Research & Development, National Aniline Div., 1051 South Park Ave, Buffalo, N. Y.

Johnson, Andy Albert
Research Chemist, Research & Development Dept., National Aniline Div. Allied Chemical & Dye Corp, Buffalo, N. Y.

Moskowitz, Lewis D.
Chemist, Research Laboratory, Stein Davies Co., 12-10 Jackson Ave., Long Island City, N. Y.

RAISED FROM MEMBER TO FELLOW

Davis, Gilbert Irwin
Research Chemist, Biochemistry Dept., Wyeth Institute of Applied Biochemistry, Wyeth Inc., 900 N. Broad St., Philadelphia 30, Pa.

Opdyke, Donald Lloyd
Chemical Division, Research Dept., The Proctor & Gamble Co., Cincinnati 17, Ohio.

Sanders, John Hillhouse
Technical Sales Representative, Chemical Sales Division, Tennessee Eastman Co., 260 Madison Ave., New York 16, New York.

RAISED FROM ASSOCIATE TO FELLOW

Erdman, John Gordon
Research Fellow, Gulf Research & De- & Development Co., Fellowship, Mellon Institute, Pittsburgh 13, Pa.

Cole, Albert J.
Chief Chemist, Supervisor of Metal Finishing, Pottstown Mfg. Co., Pottstown, Pa.

Gold, Robert M.
Senior Chemist, Keuffel & Esser Co., 300 Adams St., Hoboken, N. J.

Muder, Richard Edward
Senior Chemical Engineer, Research Dept., Koppers Co., Inc., Box L., Verona, Pa.

The application of Francis M. Turner was presented and he was elected posthumously as a Fellow.

AIC Activities

C. P. Neidig, F.A.I.C.

Chicago Chapter

Chairman, Dr. B. S. Friedman
Chairman-elect, H. F. Schwarz
Vice Chairman, Mary Alexander
Secretary-treasurer, W. Jacobson
Representative to National Council, Dr. Gustav Egloff

Honor Scroll Award

The Honor Scroll of the Chicago Chapter of THE AMERICAN INSTITUTE OF CHEMISTS will be awarded to Bernard E. Schaar, president of Schaar and Company, at a dinner meeting to be held in his honor on Friday, October 10, 1952, at the Furniture Club, Chicago. Mr. Schaar is being honored for his devotion through the years to the interests of chemists as professional men and as individuals and for his untiring efforts in advancing the profession of chemistry.

Mr. Schaar received the degree of B.S. in chemical engineering from the University of Cincinnati in 1908. He has been active in the Chicago Section of the American Chemical Society for many years, serving as its chairman in 1931 and as managing editor of *The Chemical Bulletin* from 1923 to 1934. He was an organizer of the Chicago Technical Societies Council and has held several offices in that organization.

The Honor Scroll of the Chicago

—Robert D. Harvey Studio

Chapter is awarded annually to a midwestern chemist who has been outstanding in his efforts to carry out the objective of the INSTITUTE to advance the profession of chemistry.

Past recipients of this Honor Scroll are: Vladimir N. Ipatieff, Fred C. Koch, Robert B. Harper, Donald B. Keyes, Ward V. Evans, Ernest H. Volwiler, Roy C. Newton, Otto Eisenschiml, Carl S. Miner, and Herman I. Schlesinger.

Members of the INSTITUTE are cordially invited to honor Mr. Schaar at the dinner on October 10th. Ticket reservations ($3.75 per plate) should be made by sending check or money order to John Krc, Jr., Armour Research Foundation, 35 West 33rd Street, Chicago 16, Ill. Seats will be assigned to specific tables, eight to a table. If you wish to sit with a particular person or group, or if you wish fish instead of steak, please request these when you send in your reservation.

New England Chapter Honors Dr. Cabot

Left to right: J. R. Minevitch, Dr. A. W. Fisher, Jr., Raymond Stevens, W. C. Lothrop, Godfrey L. Cabot, J. W. Perry, L. T. Work, W. R. Smith, J. T. Blake, and G. J. Esselen.

The New England Chapter met June 17th with the members of the Society of Chemical Industry in the Boston Area to honor Dr. Godfrey L. Cabot for his long service to the chemical profession. He has been a member of the Society of Chemical Industry since 1884 and is one of the two senior members of the Society. At his present age of ninety-two, Dr. Cabot made a short and very capable speech on the current political situation. The Honorable L. C. S. Barber, British Consul in Boston, was a guest of honor. Raymond Stevens, councilor from the New England AIC Chapter to the National Council, presided. Dr. Lincoln T. Work, AIC president, and F. J. Curtis, president-elect of the Society of Chemical Industry, were present.

Los Angeles Chapter to Honor Dr. Seaborg

Dr. Glenn T. Seaborg, Nobel Laureate, will receive Honorary Membership in THE AMERICAN INSTITUTE OF CHEMISTS, at a meeting at the University Club, Los Angeles, California, on September 25th. Dr. Seaborg's acceptance address will be on the subject of "Nuclear Energy for Industry."

AIC members who may be traveling in the Los Angeles area at that time are cordially invited to attend this meeting. Information may be obtained from Frank T. Bewley, Braun Corporation, 2260 E. 15th St., Los Angeles.

Will You Come?

September 25, 1952. Los Angeles Chapter Meeting to present Honorary AIC Membership to Dr. Glenn T. Seaborg. University Club, Los Angeles, Calif. For information write Frank T. Bewley, Braun Corp., 2260 E. 15th St., Los Angeles, Calif.

October 10, 1952. Chicago Chapter. Meeting to present Honor Scroll to Bernard E. Schaar. Furniture Club, Chicago, Ill. For information write Dr. B. S. Friedman, 6942 Chappel, Chicago 49, Ill.

December 4, 1952. Philadelphia Chapter. Honor Scroll Award Meeting. Penn Sheraton Hotel, Philadelphia, Pa. Details to be announced. For information write Adalbert Farkas, The Barrett Division, Allied Chemical & Dye Corp., Margaret & Bermuda Streets, Philadelphia 37, Pa.

October 9, 1952. New York Chapter. Award of Honorary AIC Membership to Dr. Sidney D. Kirkpatrick, F.A.I.C. Informal social. Details to be announced. For information write John H. Sanders, Chemical Sales Div., Tennessee-Eastman Corp., 10 E. 40th St., New York 16, N.Y.

Baltimore Chapter

The Baltimore AIC Chapter met in the Northway Apartments, Baltimore, May 15. The results of the elections were as follows:

Chairman, Maurice Siegel
Vice-chairman, Dr. Norris Matthews
Secretary-Treasurer, J. Bernard Edmonds
Council Representative, Dr. Albin Warth
News Reporter, Ralph W. Lamenzo

After the business meeting, Maurice Siegel, of the Strasburger and Siegel Company, gave a very interesting talk on "Expert Court Testimony." It was interesting to note how often a chemist can make or break a court case.

Mr. Siegel showed where various ruses are applied by the opposition to discredit him as an expert chemical engineer. Many times, after being disqualified on the chemical basis, he was able to upset the opposition by re-appearing as a mechanical engineer or canning expert. He also pointed out how a company with a reputation may be drawn in on a framed case where an individual is trying to sue a company on the basis of its products being faulty and claims of physical damages.

A very interesting case was one that occurred recently on New York docks where tomato paste containers, coming from Italy, had exploded and damaged surrounding materials. He was able to find that slight pin holes in the metal had allowed enough bacteria to enter the containers, which promoted fermentation that ultimately ruined the package.

Many other type cases were described, which all went to prove that the road of a chemical engineer is not an easy one.

Information

"Survival Under Atomic Attack." Booklet. 10 cents. Supt. of Doc., U.S. Gov. Printing Off., Washington 25, D.C.

"Ductile Bismuth Wire and Ribbon." Booklet. Fitzpatrick Electric Supply Co., 444 Irwin at Wood, Muskegon, Mich.

"Blue M Line of Electric Furnaces," and "Vanton *Flex-i-liner* Pump." leaflets. The Emil Greiner Co., 20-26 N. Moore St., New York 13, N.Y.

"Umbrella Stirrer." Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Penn.

"The South Amboy Port Explosion." Report. The National Board of Fire Underwriters, 85 John St., New York 7, New York.

"Marketing of Chemical Products." Book. By Robert S. Aries, F.A.I.C., & William Copulsky. 150 pp Lithoprint. $3.00. Chemonomics, Inc., 400 Madison Ave., New York 17, N.Y.

"Cargille Check List." Laboratory apparatus. R. P. Cargille, New York 6, N.Y.

"New Laboratory Balances." Information. Christian Becker, Division of Torsion Balance Co., Clifton, N. J.

"Tables of the Binomial Probability Distribution." 387 pp. Buckram bound. Applied Mathematics Series No. 6. $2.50 a copy from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

"Compounded Chemicals Reference Guide to Aviation Maintenance, Operations and Overhaul" and "Stratotech Service Data Sheets." Information sheets. Fine Organics, Inc. Aviation Chemicals Div., 211 E. 19th St., New York 3, N. Y.

"New Automatic Plug Valve Lubricator." Information. Delta Engineering Sales Co., P. O. Box 678, Shreveport, La.

"Colors for Paint, Lacquer and Enamel." Catalog. Pigment Dept., American Cyanamid Co., Calco Chemical Div., Bound Brook, N. J.

For Your Library

Molybdenum Compounds

Their Chemistry and Technology. By D. H. Killeffer, F.A.I.C., and Arthur Linz, F.A.I.C. Interscience Publishers, Inc. 1952, 407 pp. 6" x 9¼". $10.50.

This book represents a useful and much-needed contribution to the literature of inorganic chemistry The combination of the two authors is particularly happy. One of them, Arthur Linz, has spent a large part of his adult life in the technology of molybdenum, while the other, D. H. Killeffer, has devoted the major part of his life to the felicitous as well as accurate expression of chemical matters.

The book contains fourteen chapters, one of which is labeled as an introduction. The second chapter is an excellent resume of the sources and recovery of molybdenum commercially. Thereafter the chapters include material on the properties of molybdenum. There are successively chapters on molybdenum oxides, sulfides and halides, and a chapter on molybdenum anions and complex anions of molybdenum. The ninth chapter is contributed by Linus Pauling and discusses the structural chemistry of molybdenum. Chapter 10 is headed Molybdenum in Life Processes. Chapter 11, which is concerned with analytical procedures is particularly authoritative because it contains the procedures used by the Climax Molybdenum Company in its routine control work. There are two chapters on molybdenum in colors and miscellaneous applications of molybdenum compounds respectively. The final chapter, which is almost half the book in length, contains a discussion of molybdenum catalysts, an index to a bibliography on catalysts, a patent survey and a literature survey.

With this wealth of information, it seems almost captious to note that the preparations of some of the more unusual compounds of molybdenum are not given or are given only a literature reference. The paragraph on molybdenum sesquioxide apparently contains an error in that the compound formed by dry reaction is stated to be a mixture of Mo and MoO_2. In view of the fact that an exothermic reaction takes place between Mo and MoO_2, this conclusion seems improbable.

However, as the authors point out, there is still much room for investigation into the chemistry of molybdenum.

The format of the book, as always with the books of this publisher, is highly satisfactory. Every college library as well as every practitioner of industrial chemistry with possible applications of catalysis and every inorganic chemist should have a copy.

—KARL M. HERSTEIN, F.A.I.C.

The Chemistry of Lignin

By Friedrich Emil Brauns. Academic Press. 1952. *XV.* 808 *pp.* $14.50.

Lignin is "one of the most complicated and elusive natural products known to chemists" (p. 2). In various proportions it accompanies cellulose in plant materials. While producing about 13.5 million tons of chemical pulp from wood, industrial operations remove about eight million tons of lignin a year. The chemistry of this natural product has been the object of great efforts, particularly in the last thirty years. Brauns, who has made remarkable experimental contributions in this field, now presents a complete and detailed account, the fruit of twenty years of work. After a survey of the evolution of lignin chemistry, he reveiws about all that has been published concerning the isolation, determination, physical properties, chemical reactions (including biological decomposition), theories of structure, and linkage and formation in the plant. Technical uses and applications are not extensively considered. The report is enlivened by critical evaluations and comparative tabulations. A great amount of definite information on the chemistry of lignin has been obtained. "The results of the hydrogenation of lignin, whereby up to 50 per cent cyclohexylpropane derivatives are obtained, show that a large part is made up of phenylpropane derivatives . . ." (p. 670). "Furthermore, there is little doubt that lignin is a high polymer which is formed to the extent of at least 75 per cent, if not entirely, from phenylpropane building stones" (p. 670). The controversy about the form in which lignin naturally occurs is, however, wide open. "Upon considering the various arguments pro and con for a lignin-carbohydrate linkage,[3] it becomes apparent that neither side has an ultimate proof" (p. 687). Thus, much work remains to be done. The publication of this book will certainly stimulate and facilitate this future work.

The great number of references in this thorough, well-organized and fully integrated study is arranged at the end of each of the twenty-seven chapters, in the alphabetical order of the names of the first authors. I should like to add a remark concerning this arrangement of the references which is not meant as a criticism of the author.

The method of placing footnotes far away from the textual connection in which they occur is finding widespread use in our scientific books, but it is so burdensome that it might be called "the alphabetical reference disease." The position in the alphabet of the first letter of an author's name has nothing to do with his published work. A nonsensical formalism forces a great deal of additional work upon the author of a book and destroys part of the usefulness of the references to the reader. The desirability of a return to a sound and logical method of arranging references is perhaps most strongly felt for books which are as interesting and outstanding as Brauns'.

—DR. EDUARD FARBER, F.A.I.C.

Selective Toxicity with Special Reference to Chemotherapy

By Adrien Albert. John Wiley & Sons, Inc. 1951. 228 pp. 4¾" x 6¾". $1.75.

Based on a course of public lectures delivered in the department of biochemistry, University College, London, in 1949, this monograph is intended for research workers and senior students in biochemistry, medicine, veterinary science and agriculture. Applying to selective toxicity (usually treated as a branch of technology rather than of science) the method of the limiting factor, the author records the various physical, chemical and biochemical properties of various drugs, weedkillers and insecticides, and examines the way in which each of these properties plays its part in the biological action of the substance.

Here is a book "intended to help people who wish to get away from mere 'proper resemblances between the formulae of molecules and to base their reasoning on something more fundamental." And here is another monograph in the Menthuen series which presents in brief form author-

itative information which could be obtained only at the cost of considerable time and trouble by anyone not working in the field.

—Dr. Frederick A. Hessel, F.A.I.C.

Principles of Chemical Thermodynamics

By Martin A. Paul, McGraw-Hill Book Co. 740 pp. 6" x 9". $7.50

This is a book on thermodynamics for advanced students. The development is thorough and carefully thought out, but lacks clarity for the less-advanced student. Most of the data are contained in problems at the end of each chapter with answers in the back of the volume. A good index covers the data in the problems which are many and varied.

—Dr. John A. Steffens, F.A.I.C.

Advances in Enzymology

Vol. 12. *F. F. Nord, Editor. Interscience Publishers, Inc.* 570 *pp.* 9½" x 6½" $9.75.

The subjects contained in this volume of eleven reviews include oxidoreduction in chloroplasts, fixation of carbon dioxide, enzyme-substrate compounds, specificity of peptidases, enzymic hydrolysis and synthesis of acetylcholine, starch chemistry, starch hydrolysis and synthesis by enzymes, biological methylation, and borate in biology. All of these reviews, without exception, should be of considerable interest to the enzymologist.

—Dr. Henry Tauber, F.A.I.C.

Chemical Books Abroad

Rudolph Seiden, F.A.I.C.

The National Formulary 1952 (196 pp., 4s 6d) is a revision of the 1949 edition of the same publication. It is the British counterpart of our National Formulary, but much smaller; the chapter entitled "Notes for Prescribers" includes many interesting monographs on newer therapeutical agents.

Walther de Gruyter & Co., Berlin: *Logarithmische Rechentafeln*, by F. W. Kuester and K. Fischbeck, 64th ed., 308 pp., 1 table, DM 14.80. How glad I am to get this latest edition of my 30-year old "Kuester"—one of the most useful books I know of! It contains most of the figures — always with logarithms — a chemist may need in his daily work. A thumb index has been added to simplify finding data. Most of the tables can be used by anyone able to read chemical formulas, regardless of his ability to understand German. • *Einfuehrung in die hoehere Mathematik*, by E. Asmus, 2nd ed., 400 pp., 178 ill., DM 22. An introduction into higher mathematics — differential and integral calculus; functions of 2 variables—, with emphasis on chemical and physical-chemical problems.

Verlag Hans Carl, Nuernberg: *Neue Alkohol-und Extract-Tafel 20°/20°* by Otto Reichard, 1951, 59 pp., paper bound, DM 3.20. New tables for the determination of the % v/v, % w/v, or % w/w alcohol content of alcoholic beverages with the help of a pycnometer at 20°C temperature for both air and alcohol-water mixture. • *Die Brauerei im Bild*, by K. Hennies and R. Spanner, 3rd ed., 171 pp., 110 ill., DM 8.50. The author lets well-selected photos and drawings tell the story of the production of good beer. Text and tables are included only for the purpose of explaining or supplementing the illustrations. • *Die Desinfektionstechnik im Brauereibetrieb*, by Hans Schnegg, 2nd ed., 237 pp., 9 ill., DM 12. Disinfection is of utmost importance in breweries. The currently used disinfecting agents and techniques are fully described. A final chapter gives methods for testing the efficiency of disinfectants and of the sterility of the disinfected containers and equipment.

Cambridge University Press, London (New York 22): *General Notes on the Preparation of Scientific Papers*, 1950, 26 pp., $0.50. A little pamphlet prepared by the Council of the Royal Society in the hope that it may help improve the quality of scientific papers.

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—Thomas Jefferson

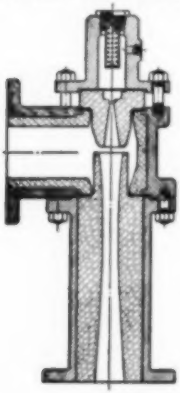
People fail to adopt the right spirit toward their life work, and consequently fail to enjoy the satisfaction and the happiness which comes from doing a job, no matter what it is, absolutely in the best way within their power."

—Thomas A. Edison

In the early years of our country nine farm workers produced enough food for themselves and one other person. In 1940, one farm worker produced enough for himself and nine others and the trend has continued. This achievement was made possible by the discovery of new machinery, the development of new strains of plants and animals, and the production of chemicals which provide nutrients and control disease and insect pests.

The second item on page 356, July issue of THE CHEMIST, in reference to the theory of chelation, suffered from the omission of a credit line to "Research Comments," published by Evans Research & Development Corp.

C-R Evactors Meet Corrosion Problems



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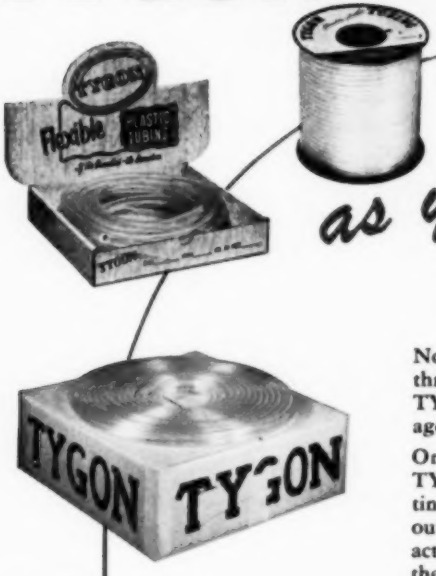

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- **IN COMPACT BOXES**
- **IN LARGE CARTONS**

Now, TYGON TUBING is packaged in three ways. Now, you can specify and get TYGON TUBING in the type of package best suited to your needs.

On the easy dispensing steel reels, TYGON TUBING is available in continuous lengths up to 2000 feet and in outside diameters up to ⅜" with the actual length depending on the O.D. of the tubing.

In the handy, hinged-lid boxes, TYGON TUBING is available in outside diameters up to ⅝", one 50 foot length per box.

In the large cartons, TYGON TUBING is available in all sizes up to 2" I.D. and in 50 foot, 100 foot, or continuous lengths.

Getting TYGON TUBING in the right package is important. But, more important is the fact that you are getting genuine TYGON TUBING. TYGON is the finest laboratory tubing made. It's glass-clear, non-toxic, fully flexible, smooth-surfaced, and non-oxidizing. It resists both acids and alkalies plus oils, greases, water, and most solvents except certain aromatic hydrocarbons.

To insure your getting genuine TYGON TUBING, every foot of this fine tubing is now permanently branded with the trade name and formulation number.

REMEMBER:

If it's Branded—
it's Genuine

AT YOUR LABORATORY SUPPLY DEALER!

THE U. S. STONEWARE CO.
AKRON 9, OHIO
PLASTICS & SYNTHETICS DIVISION

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